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Résumé: Cet article s'intéresse à l'évolution du concept de commerce équitable. Nous proposons un modèle simple en vue de donner des arguments théoriques dans le débat sur la vente de produits équitables dans la grande distribution. L'hypothèse principale est que certains consommateurs sont prêts à payer un prix plus élevé pour acheter un produit équitable. Nous mettons en évidence que les produits équitables ont plus de chance d'être dans les rayons des supermarchés si le certificateur du label équitable a pour objectif de maximiser les quantités certifiées plutôt que le prix payé aux producteurs. Nous soulignons également que la variable clé dans le choix du revendeur de vendre ou non des produits équitables n'est pas le pourcentage de consommateurs prêts à payer pour un bien équitable, mais combien ces consommateurs sont prêts à payer pour ce type de produit.

Abstract: This paper focuses on a sustainable perspective of Fair Trade concept. We propose a simple model to provide some theoretical arguments in the debate about the sale of Fair Trade labelled goods in the large-scale distribution. The main hypothesis is related to the observation that some consumers are willing to pay a premium for Fair Trade products. We show that Fair Trade products are more likely to be on retailer's shelves if the Fair Trade certifier's objective is to maximize quantities labelled rather than the price paid to producers. We also underline that the key variable in the retailer's choice to sell the Fair Trade product is not the percentage of consumers who are willing to pay a Fair Trade good, but how much the Fair Trade likers are willing to pay for it.

Mots clés : Dicrimination en prix, différentiation des produits, revente.

Key Words : Price discrimination, product differentiation, retailing.

Classification JEL: D21, L22, L31.

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1 Introduction

The growth of Fair Trade brings a large debate about the insertion of Fair Trade products into the conventional distribution network.[1] Indeed, Fair Trade organizations have a double purpose: to help producers from the South to improve their living conditions and to transform gradually international trade relations. Fair Trade being an alternative approach to conventional international trade, its consistency with the insertion of the Fair Trade products into the large-scale distribution appears as a great concern.

Fair Trade defines itself as a trading partnership, based on dialogue, transparency and respect, which seeks greater equity in international trade. It contributes to sustainable development by offering better trading conditions to, and securing the rights of, marginalized producers and workers, especially in the South.[2] In a practical hand, the Fair Trade movement attempts to eliminate middlemen in the chain and to guarantee a higher price to small producers.

Fair Trade started as a grassroots movement in the late 1960s in Europe. The aim was to alleviate poverty in the South by building direct, sustainable relationships with disadvantaged producers and providing fair access to markets in the North, using a strategy of "trade, not aid". The alternative trade organizations (Non-Governmental Organizations) created a parallel retail network with specialty stores managed as cooperatives and staffed by volunteers.[3] In 1988, a Mexican cooperative of coffee producers, who requested help in marketing their products in Europe, and a collaborator of a Dutch NGO conceived the idea of a Fair Trade certification (Renard, 2003). Products bought, traded and sold respecting Fair Trade conditions would qualify for a label that would make them stand out among ordinary products on store shelves and would allow any company to get involved in Fair Trade. Thus, the "Max Havelaar" label was established in the Netherlands. In the late 1980s, similar non-profit Fair Trade organizations began labeling Fair Trade products to facilitate their entry into conventional markets in other countries (Raynolds, 2000). In 1997, the creation of the Fair Trade La-

[1] See, for example, the virtual symposium of some French Fair Trade actors in march 2004, « La grande distribution : l'avenir du commerce équitable ? » http://www.changerdere.com/accueil/.

[2] IFAT (International Federation for Alternative Trade) http://www.ifat.org

[3] Oxfam and Twin Trading (Great Britain), Stichting Ideele Import (Netherlands) or Artisans du Monde (France) are some alternative trade organizations.

beling Organization (FLO) united many of these labeling initiatives. FLO is now responsible for setting international Fair Trade standards for certifying production, trade and labeling of a certain number of products.

Fair Trade mainly concerns agriculture and handicraft products, but only agricultural ones more or less transformed (coffee, cocoa, tea, honey, sugar, rice, bananas, fruit juices,...) can be labeled. A third-party certification agency, member of the FLO network, is in charge of making sure that Fair Trade criteria are respected.[4] The movement is a global network of producers, wholesalers, retailers, certification agencies, and consumers who commit themselves to the Fair Trade guidelines. Transparency is the core issue at all the levels of the production and distribution chains. Contrary to the other certification schemes, which focus strictly on conditions at the point of production, Fair Trade certification is unique in that its criteria cover both trade and production conditions (Raynolds, 2000).

The label first guarantees general criteria.[5] The producers have to follow certain agreements to qualify their products as Fair Trade. Small scale farmers/producers can only be certified Fair Trade if they have gathered cooperatives, associations or other organizational entities which are democratically controlled and contribute to the social and economic development of its members. The producers must tend towards the use of environmentally sustainable agricultural practices and a production of quality. Trading standards stipulate that importers have to pay a price to producers that covers the costs of sustainable production and living and a premium that small producers invest in development. As importers can pay a part of the production in advance when the producers ask for it, the latter can purchase the necessary raw materials to complete an order without falling into debt. Finally, traders must establish long-term working relationships and contracts with producers. Product-specific standards for each good that determine minimum quality, price, and processing requirements that have to be complied with, are determined and reviewed by FLO. For instance, Fair Trade coffee producers are guaranteed to earn at least US$1.26 per pound. If the coffee spot price is higher than this rate, importers pay a premium of US$0.05 per

[4]For example, in the United-States, Fair Trade products bear the "Fair Trade Certified" label and the "Fair Trade Federation" logo. TransFair USA is the third-party certifier that places the "Fair Trade Certified" label on coffee, chocolate, cocoa, tea, bananas, and other fruits.

[5]See on the website of FLO-I, http://www.fairtrade.net, to find standards in general and for all goods.

pound more. Certified organic coffee gets a further premium of US$0.15 per pound. In 2002, for arabica coffees, the difference between the Fair Trade price and the New York "C" price was equal on average to nearly US$0.72 per pound (Giovannucci, 2003).

The annual aggregate net retail value of all Fair Trade products sold in Europe through alternative channels and supermarkets would exceed €260 million, of which €million for labeled products (EFTA, 2001). Fair Trade products are sold in the 2,700 or so worldshops in Europe (18 countries) and they are available too in more than 43,000 supermarkets throughout Europe thanks to the labeling schemes. In North America (the US and Canada) and the Pacific Rim (Australia, New Zealand and Japan) Fair Trade market has grown more recently and is less developed than the European one, but it is expanding much more rapidly. Total Fair Trade sales in these regions increased by 37% during 2002, from US$183 million to US$251 million (FTF, 2003). In 2004, Fair Trade network represented 433 certified producer organizations and the number of registered traders increased from 297 from 2003 to 406 at the end of 2004 (see on the website of FLO-I, http://www.fairtrade.net).

More and more consumers know the concept of Fair Trade and declare in polls that they are willing to pay a higher price for a product with Fair Trade criteria. In Germany, according to recent market surveys, almost 37% of the population are willing to pay a higher price for coffee if it is guaranteed that the benefits are distributed to producers in developing countries. In addition, 40% of Germans believe Fair Trade is a good idea and 11% already buy TransFair-labelled tea or coffee, although the market shares of those products are no more than respectively 2% and 1%. (EFTA, 2001). In a French study (AlterEco, 2004), to the question "why have you never bought Fair Trade products?" 39.1% of the 495 surveyed people argue the lack of information, 36.7% declare not knowing a retail outlet offering Fair Trade products. At the upstream of the labeled products network, coffee farmers' groups fail to sell, on average, more than 20% of their production to Fair Trade importers (Renard, 2005) and the Fair Trade coffee, the flagship product of the concept, accounts for only 0.34% of total coffee production. Thus, Fair Trade is curbed by the lack of market opportunities and its future depends on the consumers' better knowledge.

The introduction of Fair Trade products in big retail chains is a solution to this double objective.[6] However, given the market and buying powers of large

[6]For example, in France in 2003, 66.9% of food purchases were made in supermarkets

retailers, they may impose their conditions: wholesale price cutting pressure, creation of less strict labels, risk of delisting, lack of long term contracts, and capture of the most lucrative niche. For some Fair Trade organizations, as Fédération Artisans du Monde, it is impossible to participate in large-scale distribution, because retailers are not ethic *per se*. Fair Trade organizations should avoid large retailers ran by multinationals who are part of the problem that Fair Trade is trying to fight against.

We propose a simple model to provide some theoretical arguments in this debate. In our model, a Fair Trade certifier and a traditional producer compete to supply their product to a single retailer. The main hypothesis of our model is that some consumers, called Fair Trade likers, are willing to pay a premium for Fair Trade products which depends on the producers' revenue. We thus explain the motivation of a retailer to sell some Fair Trade products thanks to the discrimination of consumers' demand. We then highlight the condition of existence of an equilibrium where the Fair Trade product coexists with the traditional brand product on the retailer's shelves. In particular, we show how a Fair Trade certifier implements this equilibrium if his preferences are such that the weight devoted to the price paid to producers is smaller than the weight he grants to the quantities of Fair Trade product sold. We underline that the key variable for a retailer to decide to sell the Fair Trade good is not the percentage of consumers who are willing to pay for it but how much the Fair Trade likers are willing to pay.

From a theoretical point of view, this paper is related to two branches of the industrial organization literature: vertical relationships, product differentiation and price discrimination. Indeed, we introduce a situation where some consumers are willing to pay for a non-tangible attribute of the product, the Fair Trade certification. The vertical differentiation is based not on a physical attribute but on a costless characteristic of the trade relationship. Fair Trade is the object of some theoretical approaches (Adriani and Becchetti (2002), Becchetti, Solferino (2003), Immordino (2002)), but to our knowledge the supply of Fair Trade products by retail chains has not yet been formalized.

This paper proceeds as follows. In the next section, we describe the assumptions of the model. Section 3 analyzes the retailer listing choice to sell either one or both the Fair Trade and the traditional product. Section 4 analyzes the upstream competition between a traditional firm and the Fair

(INSEE, 2004).

Trade certifier. In Section 5, we test the robustness of the model by introducing a change in the specification of the premium consumers are willing to pay for the Fair Trade good. Section 6 concludes.

2 The Model

2.1 The Demand

On the basis of a sample of 808 Belgian citizens and using conjoint analysis, De Pelsmacker, Driesen, Rayp (2005) (henceforth referred as DDR), study the importance of a Fair Trade label in the coffee buying decision and the willingness to pay for such a Fair Trade product. On average, a Fair Trade label is considered as the second most important coffee attribute, behind the brand and as important as aroma. The authors divide coffee buyers into four segments on the basis of the relative importance they attach to various coffee attributes (Brand, Blending, Flavor, Package, Fair Trade Label). 11% of the respondents expressed a high preference for Fair Trade label and are named "Fair Trade lovers"a and, for 40%, called the "Fair Trade likers", Fair Trade label comes out as the most important attribute but not as the prominent one.[7] DDR also evaluates the willingness to pay for a Fair Trade label: 35% of the respondents are willing to pay a price premium of 10%, 17% a premium of 20%, and 10% a premium equal to the average actual premium (27%). Notice that the data exhibit a negative correlation between the amount of the premium Fair Trade likers are ready to spend and the number of Fair Trade likers.

Based on this empirical study, we consider two varieties of the same good: the traditional product and a Fair Trade one. Unless both products have even qualities, only one good responds to Fair Trade criteria and is thus labeled by a certifier. We assume that the demand is divided into two segments of consumers: Fair Trade likers and traditional consumers. Let λ denote the proportion of Fair Trade likers in the population. When only the traditional brand is sold in the market, the demand from both traditional consumers and Fair Trade likers q is simply linear in the price charged, p: $q = 1 - p$. Conversely, when both products are available in the market, the demand from traditional consumers is $q_t = 1 - p_t$ while Fair Trade likers can move to the Fair Trade good and their demand is given by $q_f = 1 + \alpha w_f - p_f$ if

[7] The two other segments are the "flavor lovers" (24%) and the "brand lovers" (25%).

$\alpha w_f > p_f - p_t$, where αw_f denotes the premium these consumers are ready to pay for a Fair Trade product. Fair Trade likers are concerned by small producers' welfare and they are willing to pay a premium for a Fair Trade product that we assume to be related to the wholesale price w_f paid to Fair Trade producers. This assumption also requires that the information about the wholesale price paid to small producers is delivered by the certifier to consumers.[8] The parameter $\alpha \in [0, 1]$ reflects the value granted by Fair Trade likers to the enhancement of producers' revenue, that is, the wholesale price they receive. We define it as the ethical premium parameter.

Notice that our formalization of the demand comes directly from the DDR analysis: Fair Trade likers are ready to pay a premium for Fair Trade product.[9] An alternative assumption would be to consider that Fair Trade likers grant a higher "quality" to a Fair Trade good than to a traditional one which would come to use a vertical differentiation model *à la* Mussa-Rosen. We come back further on the implications of such an assumption.

2.2 The Offer

Let assume that there is one Fair Trade good produced by small producers and labeled by a certifier. We assume that the Fair Trade certifier sets the wholesale price for the Fair Trade product denoted w_f on behalf of small producers she represents. We consider that she acts as a trade union. The utility of the Fair Trade certifier $U(w_f, q_f)$ depends positively on the Fair Trade wholesale price, which determines the small producers' revenue, also as on the Fair Trade product quantity sold, which represents the number of small producers in the Fair Trade network. It is specified in the following utilitarian form:

$$U(w_f, q_f) = (w_f - w_{\min})^{\beta}(q_f)^{1-\beta},$$

where β is the certifier's wholesale price preference parameter, with $\beta \in [0, 1]$, and $w_{\min}$ the minimum wholesale price. Let $w_{\min}$ be equal to the production

[8] Since 2006, the AFNOR (Accord AC X50-340) which defines the regulation for Fair Trade at the European level, has imposed that the minimum prices and criteria recognized by Fair Trade international federations be explicitly mentioned in the bill of the small and medium entreprises law.

[9] Soberman and Parker (2004) propose a similar formalization in a paper devoted to private labels analysis. They distinguish two types of consumers: product seekers and brand seekers. The latter are willing to pay a premium for the national brand equal to the level of advertising realized by the firm.

marginal cost that we normalize to zero. When $\beta = 0.5$, the utility of the Fair Trade certifier is equal to the total profit of small producers.

Beside, a single producer offers the traditional product. We voluntarily avoid a competition effect between traditional firms.[10] The traditional producer buys his raw product at the world market price, normalized to zero and sells his product at a wholesale price denoted w_t. The certifier and the traditional producer compete to supply a single retailer.[11] The monopsonist can list either one or both products and the corresponding retail prices are denoted p_t and p_f. To simplify the analysis and without loss of generality, we normalize to zero the marginal cost of production and retailing for the two products.

2.3 The Game

We analyze the following four stages game.

In stage 1, the Fair Trade certifier chooses either to supply the retailer or not: the certifier decides either to be "in" or "out" of the market.[12]

In stage 2, the traditional firm and the Fair Trade certifier choose simultaneously their unit wholesale prices, w_t and w_f, given their objective.

In stage 3, the retailer chooses her product line. The retailer can either supply both products (FT) or one product, the traditional (T) or the Fair Trade (F) product.

In stage 4, the retailer sets retail prices for the product(s). The following sections solve the game backward.

[10] For instance, in the coffee market, there are four main roasters: Kraft, Nestlé, Procter & Gamble, Sara Lee who jointly represent 40% of green coffee volumes. In France, the four groups represent more than three-fourths of the roast and ground market (Giovannucci, 2003). In the United States, two brands, Maxwell House (Kraft Foods) and Folgers (Procter & Gamble), represent 56% of the market (Ramirez-Vallejo, 2002).

[11] We consider only one retailer, because, in most North countries, the food retailing is highly concentrated and thus each retailer has a strong market power (see Allain and Chambolle (2003)).

[12] If the certifier is out of the market, he implicitly sells his product in specialized stores, where only the most convinced and involved consumers, the militants of the Fair Trade concept, go. However this outside option profit is considered as a constant and has no role in our formalization.

3 The Retailer's Listing Strategy

To determine the optimal retailer's listing strategy, we solve backward the fourth and third stage of the game. In the stage 4, the retailer's objective functions according to the strategy chosen in stage 3 are as follows:

- Strategy (FT)

$$\pi^R_{FT}(p_f, p_t, w_f, w_t) = \lambda(1+\alpha w_f - p_f)(p_f - w_f) + (1-\lambda)(1-p_t)(p_t - w_t) \tag{1}$$

  Here, the retailer sells to Fair Trade likers the Fair Trade product and to the other consumers the traditional brand supplied by the traditional firm.

- Strategy (T)

$$\pi^R_T(p_t, w_t) = (1-p_t)(p_t - w_t) \tag{2}$$

  The retailer sells only the traditional brand. Since the Fair Trade product is not available on the market, all consumers buy the traditional brand.

- Strategy (F)

$$\begin{aligned} \pi^R_{F1}(p_f, w_f) &= [\lambda(1+\alpha w_f - p_f) + (1-\lambda)(1-p_f)](p_f - w_f) \\ &\quad \text{when} \quad p_f < 1 \\ \pi^R_{F2}(p_f, w_f) &= \lambda(1+\alpha w_f - p_f)(p_f - w_f) \\ &\quad \text{when} \quad p_f > 1 \end{aligned} \tag{3}$$

  The retailer has chosen to offer only the Fair Trdae product to consumers. Thus, if the retail price is lower than the traditional consumers' reservation price, all consumers buy the Fair Trade product. If the retail price of the Fair Trade product is higher than the traditional consumers' reservation price, only the Fair Trade likers buy this product.

We then characterize the third stage subgame equilibrium where the retailer chooses her product line by comparing her profits, given the wholesale prices charged by the traditional firm and the Fair Trade certifier.

Lemma 1. *The retailer's listing choice depends on two wholesale price thresholds of the Fair Trade product*

$$\widetilde{w}_f(w_t,\,\alpha,\,\lambda) = \frac{1-\sqrt{1-(1-\alpha^2\lambda)w_t(2-w_t)}}{1-\alpha^2\lambda} \quad \textit{and} \quad \widehat{w}_f(w_t,\,\alpha) = \frac{w_t}{1-\alpha}.$$

(i). If $w_f < \widetilde{w}_f$, the retailer sells only the Fair Trade product, at a retail price such that all consumers buy it (Case F1).

(ii). If $\widetilde{w}_f < w_f < \widehat{w}_f$, the retailer sells both products (FT).

(iii). If $w_f > \widehat{w}_f$, the retailer sells only the traditional product (T).

Proof. See the appendix A. □

The higher the Fair Trade wholesale price relatively to the traditional product wholesale price, the less likely the retailer carries the Fair Trade variety. These results are consistent with the intuition and are derived from three effects. The first effect is direct: a greater wholesale price for a product puts the retailer off distributing it. The second and third effects are related to the vertical differentiation and the retailer's ability to discriminate between both segments of consumers. As some consumers grant some value to the producers' revenue, that is, the Fair Trade products' wholesale price, the retailer can, setting two prices, discriminate between consumers. The second one is due to the ethical premium as a whole. The third effect is due to the fact that the ethical premium is itself a function of the Fair trade products' wholesale price. This effect reduces the negative effect of the first one (see Appendix B)).

Notice here that the alternative assumption of a vertical differentiation *à la* Mussa-Rosen between the Fair Trade and the traditional products would lead to trivial results. Indeed, the retailer would always have an incentive to offer both products to consumers and thanks to product differentiation the certifier would always realize a positive profit and enter the market. The assumption of a premium that consumers are willing to pay for the Fair Trade good is crucial to explain our results. Indeed, both products can coexist realizing positive profits although their product is homogenous in quality because, thanks to the Fair Trade premium, there is still a positive demand at a price strictly higher than 1. Setting a price strictly higher than 1 enables the certifier to capture a strictly positive demand without competing with the traditional producer.

The subgame equilibrium of the stage 3 is represented by Figure 1 with $\alpha = 0.6$ and $\lambda = 0.25$. The two Fair Trade product's wholesale prices thresholds are increasing in w_t. Moreover, $\widehat{w}_f(w_t, \alpha)$ is increasing in α and $\widetilde{w}_f(w_t, \alpha, \lambda)$ is decreasing in α and λ. If the Fair Trade likers are willing to pay more for the Fair Trade product and/or if the number of Fair Trade likers rises, a retailer who sold only a variety may now rather offers both varieties of the good. This is because the retailer can better discriminate between consumers and increase the retail price of the Fair Trade product.

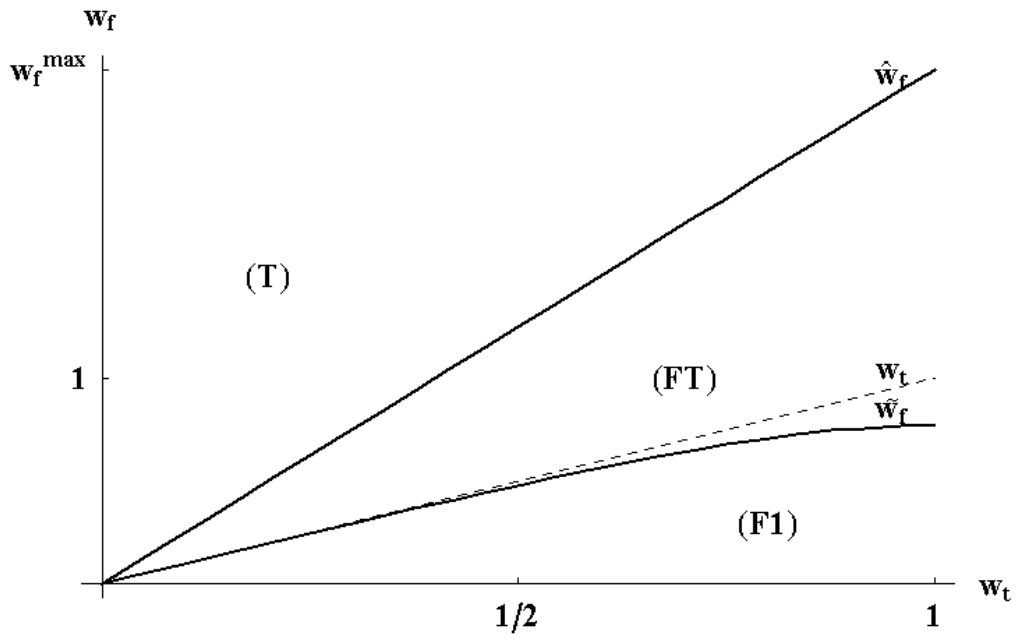

Figure 1: Listing strategies of the retailer

If the Fair Trade wholesale price is very low ($w_f < \widetilde{w}_f$) in comparison with the traditional product's wholesale price w_t ($\widetilde{w}_f < w_t$), the retailer chooses to offer only the Fair Trade product. The dominant effect is here the direct one related to the wholesale price.

For intermediate value of w_f ($\widetilde{w}_f < w_f < \widehat{w}_f$), the retailer sells both products, even if the Fair Trade product's wholesale price is lower than the

traditional brand one. Indeed, in the strategy (F,T),

$$p_f - p_t = \frac{1}{2}\left(w_f - w_t + \alpha w_f\right).$$

This is because the retail price of the Fair Trade product can be higher than the retail price of the traditional product, since the ethical premium allows the retailer to discriminate consumers. In addition, even when the wholesale price of the Fair Trade product is greater than the one of the traditional product, the benefit of the discrimination is higher than its cost. This is all the more true when the consumer grants a high value to the wholesale price received by producers. Indeed, $\widehat{w}_f$ tends towards $+\infty$ when α tends towards 1 and it does not depend on λ. In other words, if Fair Trade likers are willing to pay the value of the Fair Trade wholesale price as ethical premium, the retailer always chooses to sell the Fair Trade variety, even if her wholesale price is very high.

Beyond the threshold $\widehat{w}_f$, the retailer sells only the traditional brand. Despite of the discrimination effect, the Fair Trade wholesale price is here too high and discourage the retailer from offering the Fair Trade product.

4 In or Out the Market?

In stage 2, the traditional firm and the Fair Trade certifier choose simultaneously the wholesale prices of their respective variety, given their objective. The certifier objective is defined as follows:

In strategies (FT) and (F) when the retail price of the Fair Trade product is higher than 1 (case 2), the objective function of the Fair Trade certifier is as follows :

$$U_{FT}(w_f) = U_{F2}(w_f) = (w_f)^{\beta}\left(\frac{\lambda(1-(1-\alpha)w_f)}{2}\right)^{1-\beta}$$

In strategy (F), when the retail price of the Fair Trade product is lower than 1 (case 1), the Fair Trade certifier utility is

$$U_{F1}(w_f) = (w_f)^{\beta}\left(\frac{(1-(1-\alpha\lambda)w_f)}{2}\right)^{1-\beta}$$

These functions are concave in w_f. The two first order conditions allow us to obtain the optimal wholesale prices for the Fair Trade certifier without

constraint,

$$w^*_{f_F} = \frac{\beta}{1-\alpha\lambda} = \arg\max_{w_f} U_{F1}(w_f) \quad \text{and} \quad w^*_{f_{FT}} = \frac{\beta}{1-\alpha} = \arg\max_{w_f} U_{FT}(w_f),$$

increasing in parameters α, β, and λ for $w^*_{f_F}$, with $w^*_{f_F} < w^*_{f_{FT}}$.

To solve the game, we must find candidate equilibria for each third stage subgame and we need to check that no deviation is profitable neither for the traditional firm nor the Fair Trade certifier.

There are two potential equilibria where the Fair Trade product is sold: (1) one candidate where only the Fair Trade product is sold and (2) one candidate where the Fair Trade product and the traditional product are sold.

(1) From condition (i) (see Lemma 1), the candidate equilibrium where only the Fair Trade product is sold is such that the certifier chooses $w_f = Min\left\{w^*_{f_F}, \widetilde{w}_f\right\}$. As $\widetilde{w}_f$ strictly increases with w_t, the traditional producer has an incentive to reduce his wholesale price in order to stay in the market, which trigger a price war (see Figure 1). There is no equilibrium where only the Fair Trade product is sold.

(2) The candidate equilibrium strategy is such that $w_f = w^*_{f_{FT}}$ and $w_t = \frac{1}{2}$. The condition (ii) (see lemma 1) implies that $w^*_{f_{FT}} \in [\widetilde{w}_f, \widehat{w}_f]$ and is equivalent to:

$$\widetilde{\beta}(\alpha,\, \lambda) < \beta < \frac{1}{2} \tag{4}$$

where $\widetilde{\beta}(\alpha,\, \lambda) = \left(\frac{1-\alpha}{1-\alpha^2\lambda}\right)\left(\frac{2-\sqrt{1+3\alpha^2\lambda}}{2}\right)$.

We must verify that no deviation from this candidate equilibrium strategy is profitable for both agents.

- Deviation from the traditional producer

  The traditional producer may deviate by setting a lower w_t such that $w^*_{f_{FT}} > \widehat{w}_f$, that is, $w_t < \beta < \frac{1}{2}$. Such a deviation is profitable for the producer if and only if $\pi^T_T(\beta) > \pi^T_{FT}(1/2)$ which implies

  $$\beta > \overline{\beta}(\lambda) = \frac{1-\sqrt{\lambda}}{2}. \tag{5}$$

  If the certifier favours quantities sold (low β), his optimal wholesale price in the candidate (FT) is so low that the producer find more profitable to accommodate than to consent an important decrease in price in order to prey the certifier.

- Deviation from the Certifier

  When $w^*_{f_F} < \widetilde{w}_f$, that is, $\beta < \beta'(\alpha,\, \lambda) = \frac{1-\alpha\lambda}{1-\alpha^2\lambda}\left(\frac{2-\sqrt{1+3\alpha^2\lambda}}{2}\right)$, the possible deviation is $w^*_{f_F}$. As $\beta'(\alpha,\, \lambda) > \overline{\beta}(\lambda)$, this is the only deviation to consider. This deviation is profitable if:

  $$U_{F1}(w^*_{f_F}) > U_{FT}(w^*_{f_{FT}}),$$

  that is,

  $$\beta < \beta^*(\alpha,\, \lambda) = \frac{\ln \lambda}{\ln\left[\lambda(1-\alpha)\right] - \ln\left(1-\alpha\lambda\right)}, \tag{6}$$

  with $\beta^*(\alpha,\, \lambda) > \widetilde{\beta}(\alpha,\, \lambda)$.[13]

  The certifier deviates from the candidate equilibrium when his preference for the wholesale price is low (low β). In this case he can offer to the retailer a lower wholesale price for the Fair Trade product than the traditional one and become the sole supplier.[14]

Results regarding the two first stages of the game are summarized in the following proposition 1:

Proposition 1. *The certifier chooses to be in the market if and only if* $\beta^*(\alpha,\, \lambda) < \beta < \overline{\beta}(\,\lambda)$. *The equilibrium wholesale prices are then* $w_f = w^*_{f_{FT}}$ *and* $w_t = \frac{1}{2}$ *and the retailer sells both products.*

This proposition may be interpreted as follows. As $\overline{\beta}(\lambda)$ is strictly less than $\frac{1}{2}$, a certifier seeking to maximize the profit of the trade union would clearly be out of the market. If the certifier wants to be in the market, he has to grant a stronger weight in his objective to the number of fair trade producers involved rather than to the level of their premium. $\beta^*(\alpha,\, \lambda)$ is decreasing in λ and decreasing in α and $\overline{\beta}(\,\lambda)$ is decreasing in λ. Thus, the higher the Fair Trade likers' willingness to pay for a Fair Trade product, the more likely this product is to be on the shelves of the supermarkets next to the traditional product. Nonetheless, the effect of an increase in the number of Fair Trade likers is unclear.

Studying the condition of existence of the equilibrium leads to the following corollary:

[13] Indeed, $\beta^*(\alpha,\, \lambda) > \widetilde{\beta}(\alpha,\, \lambda)$ because $\widetilde{w}_f < \frac{1}{2}$ and $U_{F1}(w_f) > U_{FT}(w_f)$ when $w_f < 1$.

[14] We don't study the case where $w^*_{f_F} > \widetilde{w}_f$, because in this case $\beta > \beta'(\alpha,\, \lambda) > \overline{\beta}(\lambda)$, that is, the traditional firm never accommodates.

Corollary 1. *The range of β such that the certifier chooses to be in the market is non empty only if $\alpha \geq \alpha^*(\lambda)$ with $\alpha^*(\lambda) \leq 1 \; \forall \lambda$.*

Proof. We show that $\beta^*(\alpha, \lambda) < \overline{\beta}(\lambda)$ if $\alpha > \alpha^*(\lambda) = \frac{1-\lambda^{\frac{1+\sqrt{\lambda}}{1-\sqrt{\lambda}}}}{1-\lambda^{\frac{2}{1-\sqrt{\lambda}}}}$. Since $\lambda \leq 1$, one can see easily that $\alpha^*(\lambda) \leq 1$. □

These results show that the most important parameter for the Fair Trade is how much Fair Trade likers are willing to pay for a Fair Trade product. As a consequence, if the Fair Trade certifier wants to see Fair Trade products in the shelves of supermarkets, the main consumers' characteristic, which he has to take into account in his decision, is not the percentage of consumers ready to buy a Fair Trade product but how much this type of consumers are willing to pay for this product. These results are easily understandable from the retailer's point of view. Indeed, the retailer is interested by a Fair Trade product only if either her its wholesale price is lower than the one of the traditional good or if she can discriminate between Fair Trade likers and other consumers with a relatively high retail price for the Fair Trade product. The first one can not appear because that involves a price war with the traditional producer and the certifier thus does not want to enter in the market. The second solution is feasible only if the Fair Trade likers give a large enough value to the ethical characteristic of a product. Otherwise, when the ethical premium is low, the two products are not different enough from the consumers' point of view and if the certifier enters the market, a price war occurs with the traditional firm. Thus, only a strong label enables the retailer to benefit from a discrimination strategy between Fair Trade likers and traditional consumers.

At the equilibrium with the two products, the retail prices are $p_t^* = \frac{3}{4}$ and $p_f^* = \frac{1}{2} + \frac{\beta(1+\alpha)}{2(1-\alpha)} > 1$. The retailer's profit is then equal to $\frac{\lambda(1-\beta)^2}{4} + \frac{(1-\lambda)}{16} > \frac{1}{16}$. It is increasing in λ and independent of α. The traditional firm's profit is equal to $\frac{1-\lambda}{8}$ and the Fair Trade likers' surplus is $\frac{(1-\beta)^2}{8} > \frac{1}{32}$. When the traditional product is the sole product sold, the retailer's profit and the traditional firm's one are respectively equal to $\frac{1}{16}$ and $\frac{1}{8}$. As expected, the loser of the entry of the Fair Trade product in supermarkets is the traditional producer. This can explain that several traditional firms have developed their own certification similar to the Fair Trade label, such as chocolate French company Cémoi with 'Bio Equitable' (Organic Fair Trade) or the partnership between Kraft and Rainforest Alliance, where the price paid to

small producers is equal to the coffee spot price plus a premium. Notice that our model represents here the case of the"minimum guaranteed price". This representation of the ethical premium related to the wholesale Fair Trade price is not relevant in the case of "the spot market price plus a premium" since the fluctuations of the spot market price are confusing for consumers. In the latter case, given the lack of visibility on the wholesale price paid to small Fair Trade producers, it boils down to consider that consumers are willing to pay an ethical premium defined independently from the wholesale price. We analyse this extension in the following section.

5 Robustness to a change in the premium specification

The framework is unchanged except that the ethical premium Fair Trade likers are willing to pay for the Fair Trade product is now defined by a constant γ. Results are denoted by the superscript b. The Fair wholesale prices thresholds are then:

$$\widetilde{w}_f^b = 1 - \sqrt{\gamma^2\lambda + (1-w_t)^2} \quad \text{and} \quad \widehat{w}_f^b = w_t + \gamma. \tag{7}$$

The most important difference between these results and the previous ones is that when γ tends towards 1, $\widehat{w}_f^b$ tends towards $1+w_t$, while $\widehat{w}_f$ tends towards $+\infty$ when α tends towards 1. This is due to the fact that with a demand function independent of the fair wholesale price we do not obtain the third effect, the discrimination effect related to the wholesale price of the Fair Trade product.[15] This allows us to infer that the third effect plays an important role when the ethical premium parameter, α, is high.

The model with a premium independent of the wholesale price of the Fair Trade product is more complex. However, we obtain some results with numerical simulations.

We show (see Appendix C) that in a model with a premium independent of the wholesale price of the Fair Trade product, there exist two thresholds, $\beta^{*b}(\gamma,\, \lambda)$ implicitly defined and $\overline{\beta}^b(\gamma,\, \lambda)$ such that

- if $\lambda < 9\%$, then $\beta^{*b}(\gamma,\, \lambda) > \overline{\beta}^b(\gamma,\, \lambda)$ and the certifier does not enter in the market ;

[15] Indeed, with this last demand function, $\frac{\partial \pi_{FT}^{Rb}(w_f, w_t)}{\partial w_f} = -\frac{\lambda}{2}[1+\gamma-w_f] = -q_{f_{FT}}^b < 0$.

- if $\lambda > 9\%$, it exists an implicit $\gamma^*(\lambda)$ such that
  - if $\gamma < \gamma^*(\lambda)$, $\beta^{*b}(\gamma, \lambda) > \overline{\beta}^b(\gamma, \lambda)$ and the certifier chooses not to enter in the market ;
  - if $\gamma > \gamma^*(\lambda)$, the certifier chooses to be in the market if

$$\beta^{*b}(\gamma, \lambda) < \beta < \overline{\beta}^b(\gamma, \lambda). \tag{8}$$

In this case, the retailer buys both varieties of the good at the prices $w_t = \frac{1}{2}$ and $w^b_{f_{FT}} = \beta(1+\gamma)$. For the same level of ethical premium, $\gamma = \alpha w^*_{f_{FT}}$, one can see that $w^b_{f_{FT}} < w^*_{f_{FT}}$. When the demand function depends on the wholesale price of the Fair Trade product, the certifier succeeds in bargaining a higher wholesale price for small producers.

When the ethical premium is independent of the Fair Trade product wholesale price, results are qualitatively similar to those obtained with an ethical premium related to the wholesale price, even if there is a lower threshold for λ. In the present case, both parameters, γ and λ have to be relatively high to obtain the equilibrium with the two varieties. Moreover, we can say, also in this case, that the ethical premium is the most important parameter. Indeed, the higher the Fair Trade likers' willingness to pay for a Fair Trade product, the more likely this product is on the shelves of the supermarkets. Once again, the effect of an increase in the percentage of the Fair Trade likers is not clear.

At the equilibrium with the two products, the retail prices are $p^b_t = \frac{3}{4}$ and $p^b_f = \frac{(1+\beta)(1+\gamma)}{2}$. For the same level of ethical premium, $\gamma = \alpha w^*_{f_{FT}}$, the equilibrium retail price is smaller when the premium do not depend on the wholesale price ($p^b_f < p^*_f$). The consumers' surplus $\left(\frac{((1+\gamma)(1-\beta))^2}{8}\right)$ is increasing in γ and is greater when the premium does not depend on the wholesale price. The retailer's profit is then equal to $\lambda(1-\beta)\frac{(1+\gamma)^2}{4} + \frac{(1-\lambda)}{16}$, increasing in γ and is greater in the case of independency. However, for the same level of ethical premium, $\gamma = \alpha w^*_{f_{FT}}$, the certifier's utility is greater when the ethical premium depends on the Fair Trade wholesale price: when the Fair Trade likers take into account the value of small producers' revenue in the premium they allocate to the fair characteristic of products, the certifier can extract more surplus from the retailer and consumers who adhere to the Fair Trade concept. Indeed, he can negotiate a higher wholesale price of the Fair Trade product. This can also explain why some retailers, such as

Carrefour, have tried to create their own certification in order to suppress the reference to a minimum price.

6 Conclusion

This article provides some arguments in the debate about the introduction of Fair Trade products in the large-scale distribution. We have shown first that the certifier chooses to be in the market if his objective is to favor the quantity of small producers involved in the Fair Trade production rather than the level of the premium they receive. However, we have shown that this premium has to be strong enough to enable the retailer to segment consumers thanks to the price discrimination. Besides, we have shown that even if the Fair Trade organizations communicate a lot about the number of consumers who are willing to pay a higher price for a Fair Trade product, the main criterion for the introduction of this kind of good in the large-scale distribution is rather the amount of the premium that these consumers are willing to pay, an attribute more difficult to evaluate. Econometrics analysis devoted to the evaluation of the premium consumers are willing to pay for the fair trade label appears as an interesting track for further research.

Finally, our results appear to be robust to a change in the specification of the demand function where consumers' evaluation of Fair Trade does not depend on producers' revenue. But, with the hypothesis of the wholesale price-dependent demand function, we show that the Fair Trade certifier succeeds in negotiating a higher wholesale price of the Fair Trade product for small producers. This suggests that Fair Trade organizations should communicate much more about the minimum price paid to small producers. This could avoid the consumers' confusion in the choice between the internationally recognized certification (FLO) and certifications based on weaker criteria about the wholesale price paid to small producers. On that point, it is interesting to highlight the French government initiative. Before the development of the food industries' and retailers' various initiatives in order to create their own Fair Trade labels, French authorities have tried to draw up a standard for the regulation of the Fair Trade market. After four years of debates between Fair Trade actors, importers, retailers, NGO, consumers, the French norms body, AFNOR, published a reference text (Accord AC X50-340) in January 2006 which will provide a framework for future regulation, notably at the European level. This text retains three main principles: a balanced

trading relation between contractors; follow up activities in support of producers and producers' organizations; information and awareness raising for consumers and the general public in relation to Fair Trade. The most important point is that reference to the minimum prices and criteria recognized by Fair Trade international federations have to be explicitly mentioned in the bill of the small and medium entreprises law (August 2,2006 - Article 60).

A Proof of Lemma 1

At Stage 3 of the game, the retailer chooses retail prices of products according to her strategy.

- Strategy (FT)

  The condition of positive quantity of fair product is $w_f < \frac{1}{1-\alpha}$.

  The retail prices are $p_f = \frac{1+(\alpha+1)w_f}{2}$ and $p_t = \frac{1+w_t}{2}$ and the retailer's profit is $\pi^R_{FT}(w_f, w_t) = \lambda \left(\frac{1+\alpha w_f - w_f}{2}\right)^2 + (1-\lambda)\left(\frac{1-w_t}{2}\right)^2$

- Strategy (T)

  $p_t = \frac{1+w_t}{2}$ and $\pi^R_T(w_t) = \left(\frac{1-w_t}{2}\right)^2$

- Strategy (F)

  Case 1: $p_f < 1$

  $p_f = \frac{1+(\alpha\lambda+1)w_f}{2}$ with $p_f < 1 \Leftrightarrow w_f < \frac{1}{\alpha\lambda+1} = \overline{w_{f1}}$ and
  $\pi^R_{F1}(w_f) = \left(\frac{1+\alpha\lambda w_f - w_f}{2}\right)^2$

  Case 2: $p_f > 1$

  $p_f = \frac{1+(\alpha+1)w_f}{2}$ with $p_f > 1 \Leftrightarrow w_f > \frac{1}{\alpha+1} = \underline{w_{f2}}$ and
  $\pi^R_{F2}(w_f) = \lambda \left(\frac{1+\alpha w_f - w_f}{2}\right)^2$

For Stage 2 of the game, we compare retailer's profits, and we obtain that:

- whatever w_f, $\pi^R_{FT}(w_f, w_t) > \pi^R_{F2}(w_f)$,

- if $w_f < \frac{1-\sqrt{1-(1-\alpha^2\lambda)w_t(2-w_t)}}{1-\alpha^2\lambda}$, $\pi^R_{F1}(w_f) > \pi^R_{FT}(w_f, w_t) > \pi^R_T(w_t)$,

- if $\frac{1-\sqrt{1-(1-\alpha^2\lambda)w_t(2-w_t)}}{1-\alpha^2\lambda} < w_f < \frac{w_t}{1-\alpha\lambda}$, $\pi^R_{FT}(w_f, w_t) > \pi^R_{F1}(w_f) > \pi^R_T(w_t)$,

- if $\frac{w_t}{1-\alpha\lambda} < w_f < \frac{w_t}{1-\alpha}$, $\pi^R_{FT}(w_f, w_t) > \pi^R_T(w_t) > \pi^R_{F1}(w_f)$,

- if $w_f > \frac{w_t}{1-\alpha}$, $\pi^R_T(w_t) > \pi^R_{FT}(w_f, w_t) > \pi^R_{F1}(w_f)$.

Thus, the retailer's choice depends on two thresholds of the Fair Trade product's wholesale price,

$$\widetilde{w}_f(w_t,\, \alpha,\, \lambda) = \frac{1-\sqrt{1-(1-\alpha^2\lambda)w_t(2-w_t)}}{1-\alpha^2\lambda} \quad \text{and} \quad \widehat{w}_f(w_t,\, \alpha) = \frac{w_t}{1-\alpha}.$$

(i). If $w_f < \widetilde{w}_f$, the retailer sells only the Fair Trade product at a retail price such that all consumers buy this product (strategy (F1)).

(ii). If $\widetilde{w}_f < w_f < \widehat{w}_f$, then the retailer sells both products (strategy (FT)).

(iii). If $w_f > \widehat{w}_f$, then the retailer sells only the traditional product (strategy (T)).

B Analysis of the price discrimination effects

We analyze the price discrimination effects deriving the retailer's profit with respect to the Fair Trade product's wholesale price.

$$\begin{aligned} \frac{\partial \pi^R_{FT}(w_f,w_t)}{\partial w_f} &= \tfrac{\lambda}{2}[-(1-w_f+\alpha w_f)+\alpha(1-w_f+\alpha w_f)] \\ &= [-q_{f_{FT}}+\alpha q_{f_{FT}}] < 0, \end{aligned}$$

where $q_{f_{FT}}$ denotes the quantity of Fair Trade product sold in the strategy (FT).

The second effect appears through the quantity, q_f and the third effect corresponds to αq_f.

C Robustness

There are two potential equilibria where the Fair Trade product is sold: (1) one candidate where only the Fair Trade product is sold and (2) one candidate where the Fair Trade product and the traditional product are sold.

(1) If $w_f < \widetilde{w}_f^b$, condition (i)^b (see Equation 7), the retailer sells only the Fair Trade product with a retail price lower than unit. Hence, the candidate equilibrium strategy is the strategy (F1) with
$w_f = w_{f_F}^{*b} = \beta(1+\gamma\lambda) = \arg\max_{w_f} U_{F1}^b(w_f)$.

This candidate must respect the condition (i)^b, that is,

$$w_t > 1 - \sqrt{(1-\gamma\sqrt{\lambda}-\beta(1+\gamma\lambda))(1+\gamma\sqrt{\lambda}-\beta(1+\gamma\lambda))} = \underline{w_t^b},$$

and $\underline{w_t^b}$ exists only if $\beta < \frac{1-\gamma\sqrt{\lambda}}{1+\gamma\sqrt{\lambda}}$.

As in that case the traditional firm's profit is null, a profitable deviation for him is to propose a wholesale price lower than $\underline{w_t^b}$. Hence, in this case, the candidate strategy is not robust to a deviation.

(2) If $\widetilde{w}_f^b < w_f < \widehat{w}_f^b$ Condition (ii)^b (see Equation 7), the candidate equilibrium strategy is the strategy (F,T) with $w_f = w_{f_{FT}}^{*b} = \beta(1+\gamma) = \arg\max_{w_f} U_{FT}^b(w_f)$ and $w_t = \frac{1}{2}$, because the retailer sells both products.

The condition (ii)^b is equivalent to:

$$\widetilde{\beta}_1^b(\gamma,\,\lambda) < \beta < \widetilde{\beta}_2^b(\gamma), \tag{A 1}$$

Where $\widetilde{\beta}_1^b(\gamma,\,\lambda) = \frac{2-\sqrt{1+4\gamma^2\lambda}}{2(1+\gamma)}$ and $\widetilde{\beta}_2^b(\gamma) = \frac{1+2\gamma}{2(1+\gamma)}$.

We check that no deviation from this candidate equilibrium strategy is profitable for both producers.

- Deviation from the traditional firm

  The deviation for the traditional firm is to reduce w_t such that $w_{f_{FT}}^{*b} > \widehat{w}_f^b$.

  Such a deviation is profitable if and only if $\pi_T^T\left(\beta(1+\alpha)-\alpha\right) > \pi_{FT}^T(1/2)$, that is, if:

  $$\beta > \overline{\beta}^b(\gamma,\,\lambda), \tag{A 2}$$

with $\overline{\beta}^b(\gamma, \lambda) = \frac{1+2\gamma-\sqrt{\lambda}}{2(1+\gamma)} > \overline{\beta}(\lambda)$. The range of parameter β such that the traditional firm deviates is narrower when the premium is independent of the wholesale price.

The threshold $\overline{\beta}^b(\gamma, \lambda)$ is increasing in γ and decreasing in λ. If the number of Fair Trade likers is low (low λ), the traditional firm rarely deviates from the candidate equilibrium, because by accommodating he does not lose a lot of customers and he can offer a higher wholesale price. If the Fair Trade likers are willing to pay less for a Fair Trade product, all other things being equal, the traditional firm deviates more frequently from the candidate equilibrium strategy. Indeed, in this case, the certifier has a less valuable asset ahead of the retailer. The competition between the two suppliers is stronger and thus the traditional firm deviates more often from the candidate equilibrium with the two products on the retailer's listing.

- Certifier deviation
  - When $w_{f_F}^{*b} < \widetilde{w}_f^b$, that is,

$$\beta < \beta'(\gamma, \lambda) = \frac{2 - \sqrt{1 + 4\gamma^2\lambda}}{2(1 + \gamma\lambda)} < \frac{1}{2},$$

    the possible deviation is $w_{f_F}^{*b}$.
    As $\beta < \frac{1}{2}$, $w_{f_F}^{*b} < w_{f_{FT}}^{*b} < 1$. In addition, it is easy to show that when $w_f < 1$, $U_{F1}^b(w_f) > U_{FT}^b(w_f)$. Thereby,

$$U_{F1}^b(w_{f_F}^{*b}) > U_{F1}^b(w_{f_{FT}}^{*b}) > U_{FT}^b(w_{f_{FT}}^{*b}).$$

    Thus, when his preference for the wholesale price is relatively low, the certifier deviates from the candidate equilibrium.
  - When $w_{f_F}^{*b} > \widetilde{w}_f^b$, that is, $\beta > \beta'(\gamma, \lambda)$, the possible deviation is $\widetilde{w}_f^b$ and this deviation is profitable for the certifier if and only if

$$U_{F1}^b(\widetilde{w}_f^b) > U_{FT}^b(w_{f_{FT}}^{*b}).$$

    Since
    - $U_{FT}^b(w_{f_{FT}}^{*b})$ is convex in β,

* $\frac{\partial U^b_{FT}(w^{*b}_{f_{FT}})}{\partial \beta} \mid_{\beta=1} > 0$,
* $U^b_{F1}(\widetilde{w}^b_f)$ is monotonic in β,
* when $\beta = \beta'(\gamma, \lambda)$, $U^b_{F1}(\widetilde{w}^b_f) = U^b_{F1}(w^{*b}_{f_F}) > U^b_{FT}(w^{*b}_{f_{FT}})$,
* when $\beta = 1$, $U^b_{FT}(w^{*b}_{f_{FT}}) > U^b_{F1}(\widetilde{w}^b_f)$,

There exists a unique implicit threshold $\beta^{*b}(\gamma, \lambda) > \beta'(\gamma, \lambda)$ such that

- if $\beta < \beta^{*b}(\gamma, \lambda)$, the certifier deviates from the candidate equilibrium and
- if $\beta > \beta^{*b}(\gamma, \lambda)$, the certifier accommodates.

As $\widetilde{w}^b_f < w^{*b}_{f_F} < w^{*b}_{f_{FT}}$, $\beta^{*b}(\gamma, \lambda)$ decreases in γ and in λ.

As a result, the certifier chooses to be in the market if and only if $\beta^{*b}(\gamma, \lambda) < \beta < \overline{\beta}^b(\gamma, \lambda)$ and (F,T) is the equilibrium strategy with $w_f = \beta(1+\gamma)$ and $w_t = \frac{1}{2}$.

The range of β such that the certifier chooses to be in the market is non empty if $\beta^{*b}(\gamma, \lambda) < \overline{\beta}^b(\gamma, \lambda)$.

Since $\beta^{*b}(\gamma, \lambda)$ decreases in γ and in λ and $\overline{\beta}^b(\gamma\,\lambda)$ decreases in γ and in λ, $\beta^{*b}(\gamma, \lambda) < \overline{\beta}^b(\gamma, \lambda)$ if and only if $\beta^{*b}(1, \lambda) < \overline{\beta}^b(1, \lambda)$.

By numerical simulations, for $\beta = \overline{\beta}^b(1, \lambda)$ and $\gamma = 1$, we obtain that if $\lambda < 0.09031$, $U^b_{F1}(\widetilde{w}^b_f) > U^b_{FT}(w^{*b}_{f_{FT}})$, then $\beta^{*b}(\gamma, \lambda) > \overline{\beta}^b(\gamma, \lambda)$.

Finally, if $\lambda > 0.09031$, there exists an implicit $\gamma^*(\lambda)$ such that

- if $\gamma < \gamma^*(\lambda)$, $\beta^{*b}(\gamma, \lambda) > \overline{\beta}^b(\gamma, \lambda)$ and the certifier never enters in the market ;
- if $\gamma > \gamma^*(\lambda)$, the certifier enters in the market if $\beta^{*b}(\gamma, \lambda) < \beta < \overline{\beta}^b(\gamma, \lambda)$.

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